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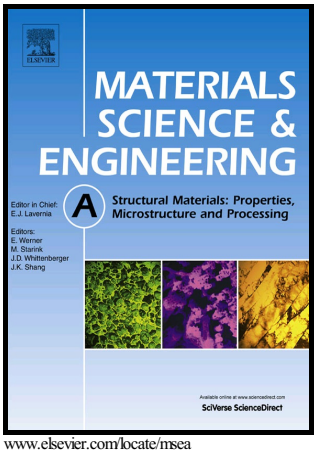

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Effect of Temperature on Microstructure and Texture Evolutions during Uniaxial Compression of Commercially Pure Titanium

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ABSTRACT

Commercially pure (CP) titanium samples were subjected to uniaxial compression of 3, 10, 20, 30, 40 and 50 % reductions at room temperature (298 K), 673 K and 873 K respectively. $\{10\bar{1}2\}$ type tensile twins were observed during the deformation at temperatures of 298 K and 673 K only. Volume fraction of these twins was increased up to 20 % reduction beyond which it was decreased on further increasing the % reduction. The non-basal orientations had higher Taylor factor values and were prone to twinning. On the other hand near-basal orientations were observed to be the possible twinning products. It was further observed that the volume fraction of dynamically recrystallized grains was increased with increase in % reductions at high temperatures. The initial non-basal texture of the samples was found to be transformed to dominant basal texture after deformation irrespective of the temperature of deformation. An abrupt transition of texture from non-basal to basal at a true strain of 0.22 of the samples deformed at a temperature of 873 K was observed and this may be attributed to the nucleation and growth of tensile twinning.

Keywords: CP-titanium, uniaxial compression, deformation twinning, dynamic recrystallization, microstructure, texture.

1. Introduction

Commercially pure (CP) titanium is widely used in different structural applications because of its high strength to weight ratio, high biocompatibility, ease of fabrication and excellent corrosion resistance [1,2]. The performance of this material depends on suitable microstructure and texture that are formed during different thermo-mechanical processing. Thus,